

REMARKS

This responds to the Notice of Non-Compliant Amendment of May 2, 2007 and final Office Action of September 8, 2006. A request for continued examination and a petition for two month extension of time were previously filed. Claims 50-69, 72-74, 78-88 and 90-102 are pending in this application. Claims 50, 61 and 80 have been amended. Reexamination and reconsideration are respectfully requested.

The Indefiniteness Rejection

The final Office Action rejected claims as indefinite based on their inclusion of the word "substantially." Applicants submit that the specification provides ready definition of what is meant by "substantially." One of ordinary skill in the art understands that semiconductor processes for depositing thin layers are subject to some variations and that a deposited layer will sometimes exhibit thickness variations. A layer that has a thickness that is constant within an expected range of processing variations has "substantially one thickness." Another standard for measuring "substantially" is provided at page 11, lines 16-17, which discusses that the cap layer 28 might have minor variations in thickness and yet still function as an effective antireflective coating (ARC) within the described photolithography process.

The rules of practice and the patent law require nothing more. As discussed at MPEP 2173.05(b), page 2100-218 (Rev. 3, August 2005), substantially is "often used" in claims because one of ordinary skill in the art would understand what is meant. See also, *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568 (Fed. Cir. 1984), (cited with approval by MPEP page 2100-216 (Rev. 3, August 2005)).

Here, the final Office Action also rejects claims on a written description theory. Applicants do not agree with the written description rejection. To advance the prosecution of this application, applicants adopt the term "minor

variations" used at page 11 rather than the terms uniform or substantially used in the prior claims. Consequently, the claims no longer use the term "substantially." Still, the above discussion of standards is appropriate in view of the relative terminology, "minor variations," used in the present claims.

Applicant notes that the large thickness variations of layer 16 of the cited Tobben reference cannot be considered to meet either the prior or current claim language, because the intentional, large thickness variations used for planarizing the substrate in the Tobben patent's method are beyond normal process variations and are far beyond the level of variations that can be tolerated for a layer to function as an antireflective coating in photolithography.

The Written Description Rejection

The final Office Action rejects claims as failing to comply with the written description requirement for their use of the terms "uniform thickness" and "having substantially one thickness." Applicants respectfully submit that this rejection is misplaced. First, there is no requirement that the precise language of the claim appear in the specification. See, e.g., MPEP 2163, page 2100-175 (Rev. 3, August 2005) ("no *in haec verba* requirement"). Any person of ordinary skill in this art understands that a layer that serves as an antireflective layer through interference has a uniform thickness, with only minor variations, or the layer will not serve as an antireflective layer. The cited portions of the application at pages 10 and 11 unambiguously describe the function of the cap layer 28 as an antireflective layer that can function through interference.

Moreover, **FIG. 1** of the present application clearly **shows that the layer 28 is formed with a uniform thickness.**

To expedite the prosecution of this application, applicants adopt the language used in the specification at page 11. As discussed there, the cap layer 28 can function as an antireflective layer if the layer has its optimal thickness or minor variations from the optimal thickness. Thus, the claims pending in the

application have been drafted specifying that the cap layer has no more than the minor variations in thickness specified at page 11 as producing effective antireflective coatings for photolithography.

The Obviousness Rejection

The outstanding Office Action rejects the claims over a combination of references, with U.S. Patent No. 5,854,126 to Tobben, et al., as the primary reference. Japanese patent publication JP-A 8-288285 is cited as the secondary reference and the below discussion refers to the translation of the '285 publication.

The Office Action identifies planarization layer 16 of the Tobben patent as corresponding to the cap layer recited in the present application. The entire purpose of the Tobben patent is to use the spin-on-glass planarization layer 16 to avoid using chemical mechanical polishing. Tobben patent, col. 2, lines 47-56, col. 1, lines 33-38. The non-uniform, varying thickness of layer 16 is apparent throughout the specification of the Tobben patent and its figures, including FIG. 2. It is the essential purpose of layer 16 that it have a non-uniform, varying thickness.

Planarization layer 16 cannot meet the "cap layer" limitation of the pending claims. For example, each of independent claims 50, 61 and 80 recites that the cap layer has "no more than minor variations in thickness." That is not true of planarization layer 16 of the Tobben patent. Claim 61 further recites a cap layer that "has a thickness ... adapted so that ... said cap layer creates destructive interference to reduce reflections." As explained in the present application at page 11, destructive interference requires a particular thickness or a thickness substantially near that particular thickness. Destructive interference is not produced by layers of widely varying thicknesses like planarization layer 16 of the Tobben patent.

Consequently, independent claims 50, 61 and 80 and their dependent claims distinguish over the Tobben patent.

The Office Action's Alternate Position Also Does Not Meet the Claims

The final Office Action stated as an alternate position that what the Tobben patent calls a cap layer, shown in FIG. 2A as 16b and described at column 3, lines 9-20 of the Tobben patent, corresponds to the "cap layer" recited in the pending claims. Applicant has clarified that layer 16b of the Tobben patent does not correspond to the recited cap layer of claim 50 by specifying that the cap layer is "on the conductive layer" of claim 50. That is not true of the layer 16b of the Tobben patent, which is formed on spin-on-glass layer 16a. Claim 50 and its dependent claims distinguish over the Tobben patent under this alternate position, as well.

With respect to claim 61, the Tobben patent's layer 16b cannot be the "cap layer" recited by claim 61 because claim 61 requires that the "cap layer creat[e] destructive interference." Layer 16b is a silicon dioxide layer formed on top of another silicon dioxide layer 16a. There is no difference in the index of refraction between these two layers 16a, 16b of the same material and so there will be no reflections from the lower surface of layer 16b. Without reflections from the lower surface of layer 16b there can be no destructive interference. Consequently, layer 16b of the Tobben patent cannot be the cap layer recited by claim 61 and claim 61 and its dependent claims distinguish over the Tobben patent.

Claim 80 is amended to clarify that "the cap layer [is] situated on the first antireflective coating" of claim 80. That is not true of the layer 16b of the Tobben patent, which is formed on the spin-on-glass layer 16a. Claim 80 and its dependent claims distinguish over the Tobben patent under this alternate position, as well.

No Cited Art Makes It Obvious to Modify the Tobben Patent

It would not have been obvious to modify the planarization layer 16 of the Tobben patent to produce the cap layer defined by the pending claims. This is because the varying thickness of the planarization layer 16 is the entire purpose of the planarization layer. As set out in the MPEP 2134.02, it is not obvious to modify a reference in a way that fundamentally changes the way that the reference operates. It would not have been obvious to make the Tobben patent's structure without the non-uniform, varying thickness layer 16a because the inclusion of the planarization layer 16a is the central teaching of the Tobben patent. Consequently, it would not be obvious to alter the teachings of the Tobben patent in view of the '285 publication to produce a structure that does not have a varying thickness planarization layer.

Similarly, the claims of this application distinguish over the Tobben patent taken in view of the '285 publication. The methods described in the '285 publication, and in what was advanced processing at the time of the present invention, were intended to produce densely packed structures and consequently the processing was performed over surfaces made planar through chemical mechanical polishing. The chemical mechanical polishing used in what was then modern processing is the very technology that the Tobben patent sought to avoid by forming its planarization film where chemical mechanical polishing would have otherwise been used. The teachings of the Tobben patent have no relevance for the processing described in the '285 publication and, for this additional reason, one of ordinary skill in the art would not find it obvious to combine the teachings of the Tobben patent with the '285 publication.

Consequently, for at least the reason that the teachings of the Tobben patent are inconsistent with the teachings of the secondary reference, the pending claims distinguish over the Tobben patent taken in view of the other cited references.

Rejections of Selected Dependent Claims

There are certain errors that applicants wish to address with respect to the dependent claims. The Office Action asserts that the “subject matter of claims 53 and 63 is considered to be a characteristic of the disclosed deposition process.” That is not true. There are implementations of HDPCVD that do not include a cap layer and instead use low etch to deposition ratios, at least at an initial stage of processing, to avoid damaging metal lines. There is no proper basis for rejecting claims 53 or 63 based on the art of record.

Similarly, claim 69 is directed to subject matter that is not “characteristic” of the HDPCVD process because HDPCVD processes were not performed that way prior to the teachings of the present application. Using a sufficiently low etch to deposition ratio, the metal lines do not need to be protected from the HPDCVD process.

With respect to paragraph 5 of the Office Action, claims 56-58 and 87 recite cross sectional shapes of the remaining portions of the cap layers. These claims do not recite any characteristics of the grooves and the Office Action fails to address the limitations of these claims.

With respect to the Office Action’s paragraph 6, the teachings of the cited ‘285 reference are completely incompatible with the fundamental planarization teachings of the Tobben patent. As discussed at MPEP 2134.02, it is not obvious to modify a reference in a way that fundamentally changes the way that the reference operates. Here, the suggested modification to the Tobben patent would violate the central teaching of the Tobben patent by removing its non-uniform, varying thickness layer 16a.

The Office Action asserts that the “subject matter of claim[] 60 is considered to be a characteristic of the disclosed deposition process.” This is not true and, in fact, claim 60 relates to the process of etching the cap layer that is distinct from and completed prior to the HDPCVD deposition process. By

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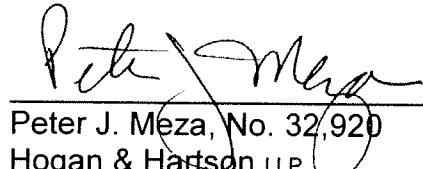
etching the cap layer (whether before, during or after etching the metal lines), the remaining portions of the cap layer have a cross section or shape that is useful for avoiding etching in the later and distinct HDPCVD process. Claim 60 is directed at subject matter that is clearly not "characteristic" of the process for etching the cap layer.

In view of all of the above, the claims are believed to be allowable and the case in condition for allowance which action is respectfully requested. Should the Examiner be of the opinion that a telephone conference would expedite the prosecution of this case, the Examiner is requested to contact Applicant's attorney at the telephone number listed below.

No fee is believed due with this transmittal, however, should any fee be required, please charge Deposit 50-1123.

Respectfully submitted,

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